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THE GENUS *ENTEROMORPHA* LINK (ULVALES: CHLOROPHYTA) AT VISAKHAPATNAM COAST, INDIA

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ABSTRACT

Enteromorpha Link is the most common green seaweed of Indian coasts and estuarine waters. The knowledge about the distribution of its species in India is however, insufficient. During an algal excursion to Visakhapatnam coast, the authors encountered following three taxa of the genus viz., *E. flexuosa* (Wulfen) J. Ag. subsp. *flexuosa*, *E. flexuosa* subsp. *paradoxa* (C.Ag.) Bliding and *E. lingulata* J.G. Ag. First and third taxa constitute new record from Visakhapatnam coast.

KEY WORDS: *Enteromorpha*, new records, Visakhapatnam coast, India

INTRODUCTION

Among the various sea weeds, reported from the coastal belts and estuarine pockets of India, *Enteromorpha* is most common. According to Krishnamurthy (2000) the genus is represented by 14 species and its infra specific taxa. Its distribution and morphological details have been worked out by various workers (Joshi & Krishnamurthy, 1972; Kale, 1966; Ramanathan ,1939; Biswas, 1932; Srinivasan, 1973; Dixit, 1968; Sarma & Suryanarayana, 1967) which has been summarized in recent checklists by Sahoo, *et al.* (2001) and Oza & Zaidi (2001). In spite of the works of various researchers our knowledge about the species distribution of the genus remains inadequate, particularly in the east coast of India. With this in view the present study was undertaken.

MATERIALS AND METHODS

Specimens were encountered from the intertidal zone of Visakhapatnam coast during a low tide status. Actually it is very important to go for collection, few hours before the time of low tide as per tide tables. This would provide more time for seaweed collection and their observation in natural condition. Samples were kept in plastic bags with detailed field notes. Herbarium sheets were prepared following the standard method (Dhargalkar & Kavlekar, 2004). Camera Lucida drawings were made from preserved specimens within a month from the date of collection using Olympus GB microscope. Some digital photomicrographs were taken by LEICA DMLB photo microscopic system. The preserved materials and permanent slide preparations are stored in Phycology Laboratory, the University of Burdwan for future study and reference purpose. Identifications were made following Setchell & Gardner (1920), Joshi & Krishnamurthy (1972); Krishnamurthy (2000).

RESULTS AND DISCUSSION

The thallus of the genus shows a hollow monostromatic tube, simple to profusely branched, sometimes showing compressed nature; rhizoidal part attached with the substratum; cells angular and arranged irregularly within a mucilaginous sheath showing a tendency to lie in vertical series; each cell uninucleate with a single parietal chloroplast usually containing a single pyrenoid, although some species have more than one.

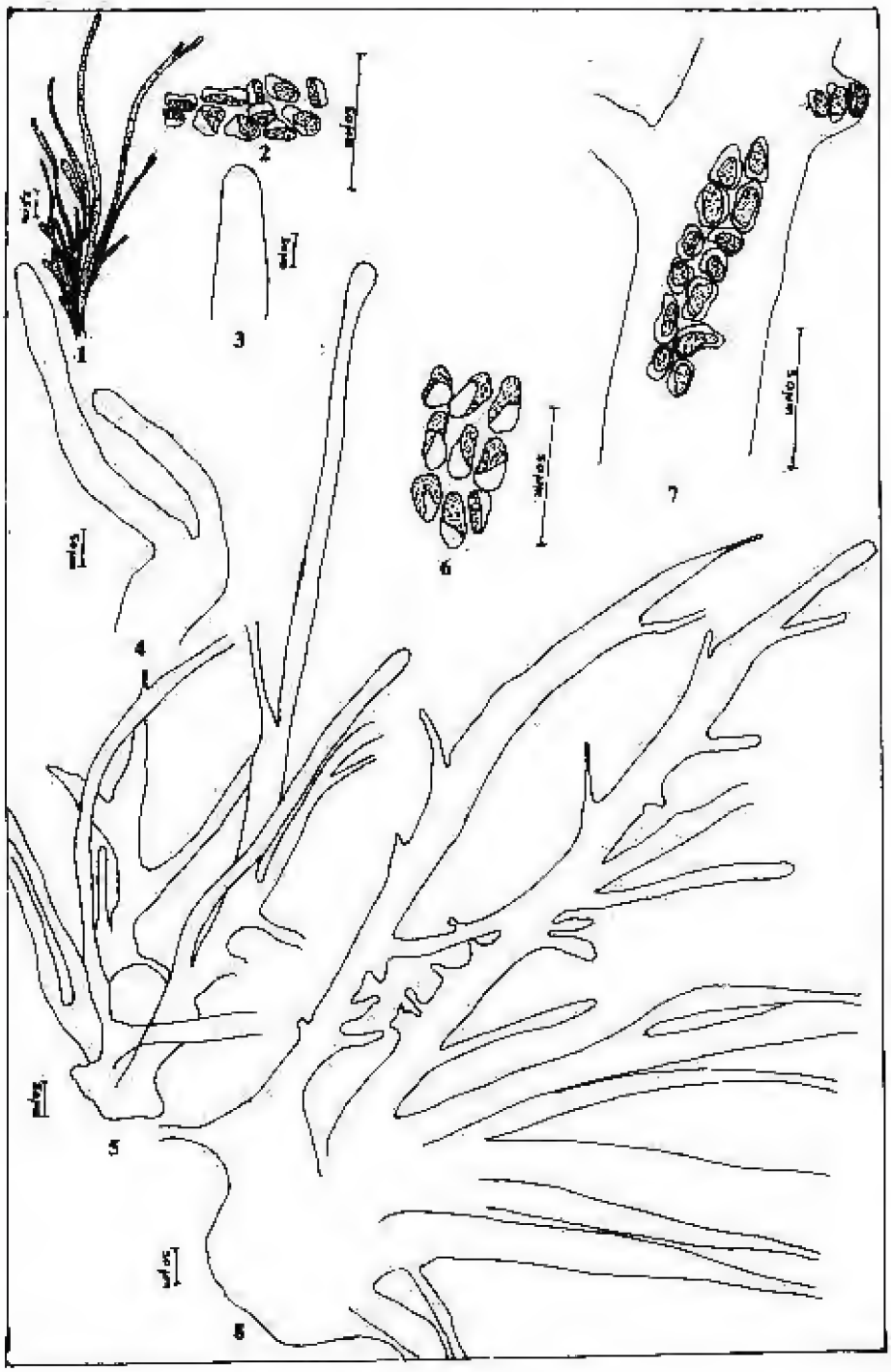
Following taxa were studied:

1. ***Enteromorpha flexuosa* (Wulfen) J. Ag. subsp. *flexuosa*** (Krishnamurthy, 2000, p. 90, fig. 13: J-L, 14: A-C)

(Plate: I, Fig.1-4; Plate: II, Figs. 9-11)

Plants 6-11 cm long, 0.4-0.8 cm wide, attached to rocky substratum with the help of basal disc, light yellowish green, branched or unbranched (Lougheed & Stevenson, 2004), tubular stalk cylindrical, blade expanding above stalk and becoming flexuous, ending in an obtuse apex; cells polygonal in surface view, except in upper flexuous part;

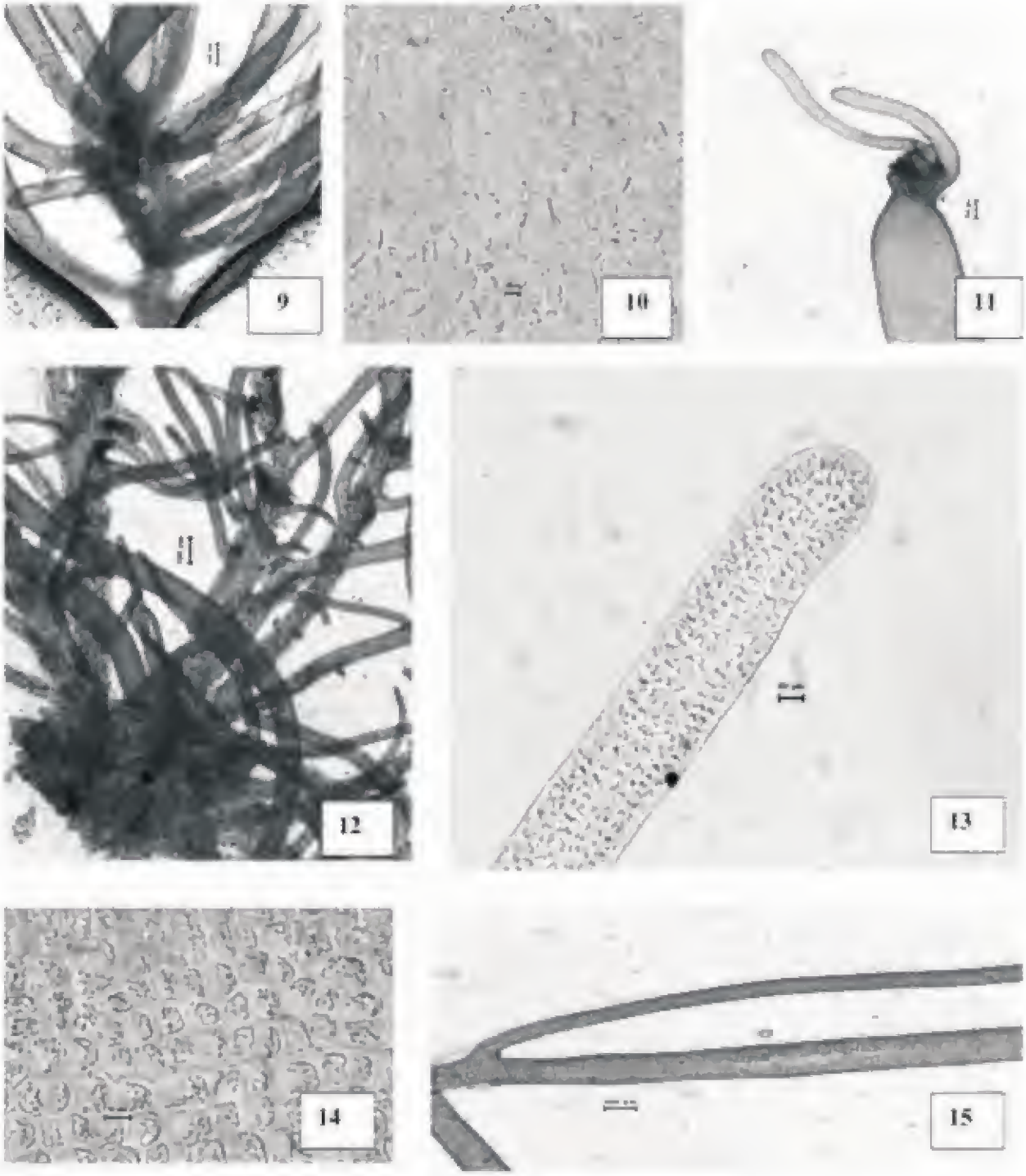
PLATE - I



LEGEND OF FIGURES

Fig.1: *Enteromorpha flexuosa* subsp. *flexuosa* (External morphology), Fig. 2: *Enteromorpha flexuosa* subsp. *flexuosa* (Cells with chloroplast and pyrenoids), Fig. 3: *Enteromorpha flexuosa* subsp. *flexuosa* (Tip portion), Fig. 4. *Enteromorpha flexuosa* subsp. *flexuosa* (Tip portion showing bifurcation), Fig. 5: *Enteromorpha lingulata* (Disc like basal portion with branched above portion), Fig. 6: *Enteromorpha lingulata* (Cells with chloroplast and pyrenoids), Fig. 7: *Enteromorpha flexuosa* subsp. *paradoxa* (A part of tubular portion with cell arrangement), Fig. 8: *Enteromorpha flexuosa* subsp. *paradoxa* (External morphology).

PLATE - II



LEGEND OF FIGURES

Fig. 9: *Enteromorpha flexuosa* subsp. *flexuosa* (External morphology showing basal branching pattern), Fig. 10: *Enteromorpha flexuosa* subsp. *flexuosa* (Cell arrangement & chloroplast nature), Fig. 11: *Enteromorpha flexuosa* subsp. *flexuosa* (Tip portion showing bifurcation), Fig. 12: *Enteromorpha lingulata* (basal branching pattern), Fig. 13: *Enteromorpha lingulata* (Tip portion). Fig. 14: *Enteromorpha lingulata* (Cell arrangement with chloroplast nature), Fig. 15: *Enteromorpha lingulata* (Upper branching pattern).

arranged in linear series, 16-20 µm in length and 9.25-11 µm in breadth; uninucleate; chloroplast covering half the cell with 3-4 pyrenoids.

Collection No. : V18

Date: 24.01.2006

Distribution in India: Dwarka, Gujarat & Maharashtra (Børgesen, 1935); Malvan harvour, Bombay (Dixit, 1940); Madras [(Krishnamurthy, 1954 as *E. prolifera* var. *tubulosa* (Kuetz.) Batters); Mandapam camp, Gulf of Mannar (Subbaramaiah, 1972); Saurastra coast, Gujarat (Parekh *et al.*, 1977); Maharashtra coast (Chauhan & Mairh, 1978; Dhargalkar *et al.*, 1980); Okha coast, Gujarat (Ohno *et al.*, 1981; Mairh *et al.*, 1985; Oza *et al.*, 1985); Karnataka coast (Agadi, 1985); Kerala coast (Nair *et al.*, 1990); Tuticorin (Kumar, 1993 a,b); Lakshadweep (Silva *et al.*, 1996).

This is the first report of the taxon from Visakhapatnam coast.

2. ***Enteromorpha flexuosa* (Wulfen) J. Ag. subsp. *paradoxa* (C. Ag.) Bliding** (Krishnamurthy, 2000, p. 90, fig. 13: D-F)

(Plate: I, Figs.7 & 8)

Plants attached with the substratum or free floating, filiform, tubular, branched repeatedly; branches tapering from base and finally ending in single series of cells; cells rectangular to sub rectangular in surface view, 13-19.5 µm in length and 6.5-13.5 µm in breadth; uninucleate with chloroplast partially filled having 2-4 pyrenoids.

Collection No. : V7, V10

Date: 23.10.2006

Distribution in India: Saurastra (Kale, 1966 as *E. plumosa* Kuetz.); Visakhapatnam, Andhra Pradesh (Joshi & Krishnamurthy, 1972); Muthupet Estuary, Tamil Nadu (Balakrishnan *et al.*, 1992 as *E. plumosa* Kuetz.); Bheemuri-Patram, Visakhapatnam (Umamaheswara Rao, 1999 as *E. plumosa* Kuetz.).

3. ***Enteromorpha lingulata* J. G. Ag.** (Krishnamurthy, 2000, p. 91, fig. 13: G-I)

(Plate: I, Figs.5 & 6; Plate: II, Figs. 12-15)

Plants 3.5-8 cm long; yellowish green, attached to the substratum by a disc shaped basal portion, branched, younger branches directed towards the base and older towards apical region; lateral branches filiform, cells polygonal to sub rectangular in surface view and arranged in linear series throughout the thallus, 16-32 µm long and 13-19 µm wide, uninucleate with chloroplast partially filled having the 1-3 pyrenoids.

Collection No. : V19

Date: 23.10.2006

Distribution in India: Madras (Krishnamurthy, 1954 as *E. compressa* (L.) Grev. var. *lingulata*); Gujarat (Joshi & Krishnamurthy, 1972; Krishnamurthy, 2000).

This is the first report of the taxon from Vishakhapatnam coast.

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